REMARKS

Claims 1, 2, and 4-21 are pending in this Application. Applicants have cancelled claim 3 without prejudice or disclaimer, and amended claims 1, 2, and 4-8 to define the claimed invention more particularly. Applicants have added new claims 9-21 to claim additional features of the invention and provide varied protection for the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-8 stand rejected under 35 U.S.C. §102(b) as being anticipated by Udagawa (JP 2000-349336).

Applicants respectfully traverse this rejection in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by exemplary claim 1) is directed to a semiconductor layer.

The semiconductor layer includes a first layer including a Ga_2O_3 system single crystal substrate, and a second layer obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms.

In a conventional semiconductor layer, as described in the Background of the present Application, semiconductor layer includes an Al_2O_3 substrate made of Al2O3, an AlN layer which is formed on a surface of the Al_2O_3 substrate, and a GaN growth layer which is formed on the AlN layer through epitaxial growth (e.g., see Application at page 1, lines 15-19).

By applying the conventional semiconductor layer, the lattice constants of the AlN layer and the GaN growth layer cannot be perfectly made match each other, and thus it is difficult to further enhance crystal quality of the GaN growth layer. In addition, when the conventional semiconductor layer is applied to a light emitting element, crystalline of a luminous layer is degraded, and luminous efficiency is reduced (e.g., see Application at page 2, lines 2-9).

The claimed invention, however, provides a semiconductor layer, in which a first

layer including a Ga_2O_3 system single crystal substrate, and the second layer is obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms. (e.g., see Application at page 2, lines 15-20).

These features are important because the second layer which has the GaN system compound semiconductor with high crystalline is obtained without interposing a buffer layer. Hence, when the GaN system epitaxial layer is formed on the second layer, the lattice constants of the second layer and the GaN system epitaxial layer can match each other, and thus the GaN system epitaxial layer having the high crystal quality can be obtained (e.g., see Application at page 12, lines 1-13).

II. THE PRIOR ART REJECTION

The Examiner alleges that Udagawa anticipates claims 1-8. Applicants respectfully submit, however, that the alleged reference does not teach or suggest each and every feature of the claimed invention.

As an initial matter, since the Examiner fails to provide a complete English translation of the non-English reference, Applicants request that, should this rejection be maintained, the Examiner provide a human translation in the next Office action. Applicants' response herein is based on the machine translation obtained from the Japanese patent office website.

Furthermore, Applicants submit that Udagawa does not teach or suggest, "*a first layer comprising a Ga_2O_3 system single crystal substrate,*" as recited in claim 1.

That is, according to Udagawa, an oxide buffer layer which contains more than 50 wt.% of β-Ga_2O_3 is not a single crystal. In particular, according to Udagawa, the oxide buffer layer which contains more than 50 wt.% of β-Ga_2O_3 is formed by a general RF-sputtering method and annealing (see Udagawa at paragraphs [0035] – [0037]). Therefore, based on the explicit teachings of Udagawa, the oxide buffer layer is not a single crystal.

In contrast, in the claimed invention, the first layer is a single crystal.

Moreover, according to the claimed invention, when β-Ga_2O_3 substrate is nitridized, a single crystal of GaN is formed. This is clarified by a thesis, ("Molecular beam epitaxy of c-plane wurtzite GaN on nitridized a-plane β-Ga_2O_3", E.G. Villaro et al., Thin Solid Film, 500 (2006), 209-213). According to this thesis, a RHEED pattern of β-Ga_2O_3 single crystal substrate which is not nitridized was 2-fold symmetry which originates from β-Ga_2O_3 single crystal, and a RHEED pattern of β-Ga_2O_3 single crystal substrate which is nitridized was 6-

fold symmetry which originates from GaN. Therefore, it is obvious that the single crystal of GaN is formed when β-Ga_2O_3 substrate is nitridized.

According to the present invention, it is possible to grow a high quality GaN epitaxial layer on the GaN single crystal, because the GaN epitaxial layer is grown on the GaN single crystal which is formed by nitridized of β-Ga_2O_3 single crystal substrate. On the other hand, according to Udagawa, the oxide buffer layer is not single crystal. Therefore, it is difficult to grow the high quality GaN epitaxial layer on the oxide buffer layer.

Furthermore, according to Udagawa, a GaN film was prepared by annealing sputtered Ga_2O_3 films under flowing ammonia. The GaN film is polycrystal.

In contrast, according to the present invention, a first layer is a single crystal substrate.

Moreover, Applicants submit that Udagawa does not teach or suggest, "*a second layer obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms,*" as recited in claim 1.

The Examiner alleges that Udagawa teaches the claimed semiconductor layer. Specifically, the Examiner attempts to analogize the layer 103 of Udagawa to the claimed second layer.

Udagawa teaches that clad layer 103 which consists of GaN of n form, in which doped Si by the usual ordinary pressure MOCVD method was grown up by using ammonia (NH3) as a nitrogen material (paragraph [0026]). Udagawa, however, is silent about and fails to teach or suggest, "*a second layer obtained by replacing a part rather than all of oxygen atoms of the first layer with nitrogen atoms,*" as recited in claim 1.

Furthermore, Applicants submit that Udagawa does not teach or suggest, "*a third layer comprising an GaN system epitaxial layer grown on the second layer,*" (emphasis added by Applicants) as recited in claim 6, and similarly recited in claim 8.

The Examiner attempts to analogize the layer 104 of Udagawa to the claimed third layer. The Examiner, however, is incorrect.

Indeed, Udagawa teaches that the alleged layer 104 is laminated on the lower clad layer 103 (paragraph [0027]). This is different from and fails to teach or suggest, "*a third layer comprising an GaN system epitaxial layer grown on the second layer,*" (emphasis added by Applicants) as recited in claim 6, and similarly recited in claim 8.

Moreover, Applicants submit that Udagawa does not teach or suggest, "*wherein the*

first layer comprises at least one of $(In_xGa_{1-x})_2O_3$ *where* $0 < x < 1$, $(Al_xGa_{1-x})_2O_3$ *where* $0 < x < 1$, $(In_xAl_yGa_{1-x-y})_2O_3$ *where* $0 < x < 1$, $0 < y < 1$, *and* $0 < x + y < 1$," (emphasis added by Applicants) as recited in claim 7.

The Examiner attempts to analogize the buffer layer 102 of Udagawa to the claimed first layer.

Udagawa, however, teaches that oxide buffer layer 102 consists of alpha type 3 gallium oxide (alpha-Ga 2O3) (paragraph [0025]). This is different from, and fails to teach or suggest, "*wherein the first layer comprises at least one of* $(In_xGa_{1-x})_2O_3$ *where* $0 < x < 1$, $(Al_xGa_{1-x})_2O_3$ *where* $0 < x < 1$, $(In_xAl_yGa_{1-x-y})_2O_3$ *where* $0 < x < 1$, $0 < y < 1$, *and* $0 < x + y < 1$," (emphasis added by Applicants) as recited in claim 7.

Indeed, Udagawa fails to teach the claimed structure since Udagawa addresses a different problem.

Therefore, Applicants respectfully submit that Udagawa fails to teach or suggest each element of Applicant's claimed invention. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

III. NEW CLAIMS

New claims 9-21 have been added to claim additional features of the invention and to provide more varied protection for the claimed invention. The claims are independently patentable because of the novel features recited herein.

Applicants submit that new claims 9-21 are patentable at least because of similar reasons to those set forth above with respect to claims 1, 2, and 4-8.

IV. FORMAL MATTERS AND CONCLUSION

The Examiner based the rejection upon specification of Udagawa (e.g., see Office Action at page 2, section 3), but has failed to provide the Applicants with a translation of Udagawa.

Accordingly, Applicants respectfully note that this would preclude the Examiner to issue a final rejection in the next Office Action. Indeed, such final rejection would be premature because the Examiner had failed to provide a translation of JP 2000-349336 in the present Office Action.

In view of the foregoing, Applicants submit that claims 1, 2, and 4-21, all the claims

presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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